IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.: Group Art Unit:

Inventors: Riley et al. Filed: Concurrently

Title: METHOD FOR PRODUCING
LOW CARBON STEEL

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

In accordance with 37 CFR 1.51, 1.56 and 1.97 to 1.99, the following is a relevance statement on each citation listed on attached form PTO-1449, and is made of record to assist the Patent & Trademark Office in its examination of this application:

U.S. 4,373,949 – Spruell et al. discloses a method for increasing the life of the refractory lining of a basic oxygen furnace comprising introducing excess dolomitic lime into the furnace and introducing inert gas into the melt to cause intensive interaction between the slag and the melt. There is no disclosure of a method for producing low carbon steel wherein molten steel is decarburized in a three stage refining procedure comprising a first stage wherein oxygen is provided for decarburization enveloped in a gas shroud, a second stage wherein oxygen is provided for decarburization enveloped in a flame shroud, and a third stage wherein inert gas or oxygen and inert gas is provided enveloped in a flame shroud, and thus this patent neither discloses nor suggests the claimed invention.

U.S. 4,397,685 – Maddever et al. discloses a method for producing steel having an ultra low carbon content using the basic oxygen process wherein an inert gas is introduced into the melt when the melt has a carbon content below about 0.6 weight percent, the oxygen flowrate is adjusted to from 10 to 40 percent of the inert gas flow rate, and the oxygen lance height is reduced to from

30 to 60 percent of the normal lance height. There is no disclosure of a method for producing low carbon steel wherein molten steel is decarburized in a three stage refining procedure comprising a first stage wherein oxygen is provided for decarburization enveloped in a gas shroud, a second stage wherein oxygen is provided for decarburization enveloped in a flame shroud, and a third stage wherein inert gas or oxygen and inert gas is provided enveloped in a flame shroud, and thus this patent neither discloses nor suggests the claimed invention.

U.S. 5,814,125 – Anderson et al. discloses a method for introducing gas into a liquid wherein the gas stream is surrounded by a flame envelope which shields the gas from ambient gas entrainment. There is no disclosure of a method for producing low carbon steel wherein molten steel is decarburized in a three stage refining procedure comprising a first stage wherein oxygen is provided for decarburization enveloped in a gas shroud, a second stage wherein oxygen is provided for decarburization enveloped in a flame shroud, and a third stage wherein inert gas or oxygen and inert gas is provided enveloped in a flame shroud, and thus this patent neither discloses nor suggests the claimed invention.

U.S. 6,125,133 – Mathur et al. discloses a method for providing gas into a pool of molten metal, particularly for use in an electric arc furnace, wherein oxygen is combusted with fuel to form a flame envelope around the gas stream which protects the gas stream from entrainment of ambient gases as it passes through the headspace of the furnace. There is no disclosure of a method for producing low carbon steel wherein molten steel is decarburized in a three stage refining procedure comprising a first stage wherein oxygen is provided for decarburization enveloped in a gas shroud, a second stage wherein oxygen is provided for decarburization enveloped in a flame shroud, and a third stage wherein inert gas or oxygen and inert gas is provided enveloped in a flame shroud, and thus this patent neither discloses nor suggests the claimed invention.

U.S. 6,176,894 – Anderson et al. discloses a system for establishing and maintaining a supersonic coherent gas jet, effective with either an oxidizing or an inert gas, employing a converging/diverging nozzle for establishing a supersonic gas jet, and a slower moving triple layered flame envelope coaxial with the jet. There is no disclosure of a method for producing low carbon steel wherein molten steel is decarburized in a three stage refining procedure comprising a first stage wherein oxygen is provided for decarburization enveloped in a gas shroud, a second stage wherein oxygen is provided for decarburization enveloped in a flame shroud, and a third stage wherein inert gas or oxygen and inert gas is provided enveloped in a flame shroud, and thus this patent neither discloses nor suggests the claimed invention.

U.S. 6,241,510 – Anderson et al. discloses a system for providing gases into an injection volume in one or more coherent gas jets proximate to one or more turbulent gas jets wherein a coherent gas jet is formed in a forming volume with a flame envelope prior to passage into the injection volume into which the turbulent gas jets are directly passed. There is no disclosure of a method for producing low carbon steel wherein molten steel is decarburized in a three stage refining procedure comprising a first stage wherein oxygen is provided for decarburization enveloped in a gas shroud, a second stage wherein oxygen is provided for decarburization enveloped in a flame shroud, and a third stage wherein inert gas or oxygen and inert gas is provided enveloped in a flame shroud, and thus this patent neither discloses nor suggests the claimed invention.

U.S. 6,432,163 – Sarma et al. discloses a metal refining method particularly useful with a basic oxygen steelmaking process wherein during an initial period refining oxygen is provided into the furnace headspace surrounded by a shroud comprising oxygen and inert gas, and during a subsequent period refining oxygen is provided into the furnace headspace surrounded by a flame shroud. There is no disclosure of a method for producing low carbon steel wherein molten steel is decarburized in a three stage refining procedure comprising a first stage wherein oxygen is provided for decarburization enveloped in a gas shroud, a second stage wherein oxygen is provided for

decarburization enveloped in a flame shroud, and a third stage wherein inert gas or oxygen and inert gas is provided enveloped in a flame shroud, and thus this patent neither discloses nor suggests the claimed invention.

U.S. 6,604,937 – Mahoney discloses a coherent jet lance and operating method wherein the need for a lance extension is eliminated using a single ring of ports to deliver flame envelope gases around the primary gas jets to maintain the gas jets coherent. There is no disclosure of a method for producing low carbon steel wherein molten steel is decarburized in a three stage refining procedure comprising a first stage wherein oxygen is provided for decarburization enveloped in a gas shroud, a second stage wherein oxygen is provided for decarburization enveloped in a flame shroud, and a third stage wherein inert gas or oxygen and inert gas is provided enveloped in a flame shroud, and thus this patent neither discloses nor suggests the claimed invention.

Respectfully submitted,

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Date: JANUARY 21, 2004

Form PTO-1449 (Rev. 8-83) U.S. Department of Commerce

Information Disclosure Citation

(Use several sheets if necessary)

Atty. Docket No.	Serial No.
D-21386	
Applicants	
Filing Date	Group

U.S. PATENT DOCUMENTS

Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
		4,373,949	2/1983	Spruell et al.	75	60	
		4,397,685	8/1983	Maddever et al.	75	60	
		5,814,125	9/1998	Anderson et al.	75	414	
		6,123,753	9/2000	Mathur et al.	373	8	
		6,174,349	1/2001	Anderson et al.	75	414	
		6,221,104	6/2001	Anderson et al.	431	8	
		6,423,103	8/2002	Sarma et al.	75	414	
		6,607,570	8/2003	Mahoney	431	8	5-24-02

FOREIGN PATENT DOCUMENTS

		Document Number	Date	Country	Class	Subclass	Translation Yes	Translation No

Other Documents (including Author, Title, Date, Pertinent Pages, Etc.)

Examiner	Date Considered

* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.